CLAIMS

What is claimed is:

1. A electroosmotic pump comprising:
   a. at least one porous structure for pumping fluid therethrough, the porous structure having a first side and a second side and having a first continuous layer of electrically conductive porous material having an appropriate first thickness disposed on the first side and a second continuous layer of electrically conductive porous material having a second thickness disposed on the second side, wherein at least a portion of the porous structure is configured to channel flow therethrough; and
   b. means for providing electrical voltage to the first layer and the second layer to produce an electrical field therebetween, wherein the means for providing is coupled to the first layer and the second layer.

2. The electroosmotic pump according to claim 1 further comprising means for generating power sufficient to pump fluid through the porous structure at a desired rate, wherein the means for generating is coupled to the means for providing.

3. The electroosmotic pump according to claim 1 wherein the porous structure includes a plurality of fluid channels extending between the first side and the second side.

4. The electroosmotic pump according to claim 1 wherein the first side and the second side are roughened.

5. The electroosmotic pump according to claim 3 wherein the plurality of fluid channels are in a straight parallel configuration.

6. The electroosmotic pump according to claim 3 wherein the plurality of fluid channels are in a non-parallel configuration.

7. The electroosmotic pump according to claim 3 wherein at least two of the plurality of fluid channels are cross connected.

8. The electroosmotic pump according to claim 1 wherein the electrically conductive porous material is disposed as a thin film electrode.

9. The electroosmotic pump according to claim 1 wherein the electrically conductive porous material is disposed as a screen mesh having an appropriate electrically conductivity.

10. The electroosmotic pump according to claim 1 wherein the electrically conductive porous material includes a plurality of conductive beads having a first diameter in contact with one another to pass electrical current.

11. The electroosmotic pump according to claim 10 wherein at least one of the plurality of beads has a second diameter larger than the first diameter.

12. The electroosmotic pump according to claim 1 wherein a predetermined portion of the continuous layer of electrically conductive porous material has a third thickness.

13. The electroosmotic pump according to claim 12 wherein the predetermined portion of the continuous layer is disposed on the surface of the porous structure in one or more desired patterns.

14. The electroosmotic pump according to claim 13 wherein at least one of the desired patterns further comprises a circular shape.

15. The electroosmotic pump according to claim 13 wherein at least one of the desired patterns further comprises a cross-hatched shape.

16. The electroosmotic pump according to claim 13 wherein at least one of the desired patterns further comprises a plurality of parallel lines.

17. The electroosmotic pump according to claim 1 wherein at least a portion of an outer region of the porous structure is made of fused non-porous glass.

18. The electroosmotic pump according to claim 1 wherein the first thickness is within the range between and including 200 Angstroms and 10,000 Angstroms.

19. The electroosmotic pump according to claim 1 wherein the second thickness is within the range between and including 200 Angstroms and 10,000 Angstroms.

20. The electroosmotic pump according to claim 1 wherein the electrically conductive porous material is Platinum.

21. The electroosmotic pump according to claim 1 wherein the electrically conductive porous material is Palladium.

22. The electroosmotic pump according to claim 1 wherein the electrically conductive porous material is Tungsten.

23. The electroosmotic pump according to claim 1 wherein the electrically conductive porous material is Copper.

24. The electroosmotic pump according to claim 1 wherein the electrically conductive porous material is Nickel.

25. The electroosmotic pump according to claim 1 further comprising an adhesion material disposed in between the electrically conductive porous material and the porous structure.

26. The electroosmotic pump according to claim 1 wherein the first layer and the second layer is made of the same electrically conductive porous material.

27. The electroosmotic pump according to claim 1 wherein the first layer and the second layer is made of different electrically conductive porous materials.

28. An electroosmotic porous structure adapted to pump fluid therethrough, the porous structure comprising a first side and a second side, the porous structure having a plurality of fluid channels therethrough, the first side having a first continuous layer of electrically conductive porous material deposited thereon and the second side having a second continuous layer of electrically conductive porous material deposited thereon, the first layer and the second layer coupled to a power source, wherein the power source supplies a voltage differential between the first layer and the second layer to drive fluid through the porous structure at a desired flow rate.

29. The electroosmotic porous structure according to claim 28 wherein the plurality of fluid channels extend from the first side to the second side in a straight parallel configuration.

30. The electroosmotic porous structure according to claim 28 wherein the plurality of fluid channels extend from the first side to the second side in a non-parallel configuration.

31. The electroosmotic porous structure according to claim 28 wherein at least two of the plurality of fluid channels are cross connected.

32. The electroosmotic porous structure according to claim 28 wherein the electrically conductive porous material is a thin film electrode.

33. The electroosmotic porous structure according to claim 28 wherein the first layer of electrically conductive porous material is a screen mesh.

34. The electroosmotic porous structure according to claim 28 wherein the electrically conductive porous material further comprises a plurality of conductive beads having a first diameter in contact with one another to pass electrical current.

35. The electroosmotic porous structure according to claim 34 wherein at least one of the plurality of beads has a second diameter larger than the first diameter.

36. The electroosmotic porous structure according to claim 28 wherein a predetermined portion of the continuous layer of electrically conductive porous material has a third thickness.

37. The electroosmotic porous structure according to claim 36 wherein the predetermined portion of the continuous layer is disposed on the surface of the porous structure in one or more desired patterns.

38. The electroosmotic porous structure according to claim 28 wherein at least a portion of an outer region of the porous structure is made of fused non-porous glass.

39. The electroosmotic porous structure according to claim 28 wherein the continuous layer has a thickness within the range between and including 200 Angstroms and 10,000 Angstroms.

40. The electroosmotic porous structure according to claim 28 wherein the electrically conductive porous material is Platinum.

41. The electroosmotic porous structure according to claim 28 wherein the electrically conductive porous material is Palladium.

42. The electroosmotic porous structure according to claim 28 wherein the electrically conductive porous material is Tungsten.

43. The electroosmotic porous structure according to claim 28 wherein the electrically conductive porous material is Nickel.

44. The electroosmotic porous structure according to claim 28 wherein the electrically conductive porous material is Copper.

45. The electroosmotic porous structure according to claim 28 further comprising an adhesion material disposed in between the electrically conductive porous material and the porous structure.

46. A method of manufacturing an electroosmotic pump comprising the steps of:

a. forming at least one porous structure having a first side and a second side and a plurality of fluid channels therethrough;

b. depositing a first continuous layer of electrically conductive porous material of appropriate first thickness to the first side adapted to pass fluid through at least a portion of the portion of the first layer; and

c. depositing a second continuous layer of electrically conductive porous material of appropriate second thickness to the second side adapted to pass fluid through at least a portion of the second layer.

47. The method according to claim 46 wherein the plurality of fluid channels extend from the first side to the second side in a straight parallel configuration.

48. The method according to claim 46 wherein the plurality of fluid channels extend from the first side to the second side in a non-parallel configuration.

49. The method according to claim 46 further comprising the steps of:

a. coupling a power source to the first continuous layer and the second continuous layer; and

b. applying an appropriate amount of voltage to generate a substantially uniform electric field across the at least one porous structure.

50. The method according to claim 49 wherein the power source is coupled to the first and second continuous layers via a pair of wires.

51. The method according to claim 46 wherein the layer of electrically conductive porous material is a thin film.

52. The method according to claim 46 wherein the electrically conductive porous material is a screen mesh.

53. The method according to claim 52 further comprising the step of mechanically clamping the screen mesh to the porous structure.

54. The method according to claim 46 wherein the layer of electrically conductive porous material includes a plurality of conductive beads in contact with one another.

55. The method according to claim 46 wherein a predetermined portion of the layer of electrically conductive porous material has a third thickness.

56. The method according to claim 46 wherein at least a portion of an outer region of the porous structure is made of fused non-porous glass.

57. The method according to claim 46 wherein the first thickness is within the range between and including 200 Angstroms and 10,000 Angstroms.

58. The method according to claim 46 wherein the second thickness is within the range between and including 200 Angstroms and 10,000 Angstroms.

59. The method according to claim 46 wherein the electrically conductive porous material is Platinum.

60. The method according to claim 46 wherein the electrically conductive porous material is Copper.

61. The method according to claim 46 wherein the electrically conductive porous material is Palladium.

62. The method according to claim 46 wherein the electrically conductive porous material is Tungsten.

63. The method according to claim 46 wherein the electrically conductive porous material is Nickel.

64. The method according to claim 46 further comprising the step of depositing an adhesion material to a surface of the electrically conductive porous material.

65. The method according to claim 46 further comprising an adhesion material disposed in between the electrically conductive porous material and the second side of the porous structure.

66. The method according to claim 46 wherein the electrically conductive porous material is applied by an evaporation process.

67. The method according to claim 46 wherein the electrically conductive porous material is applied by a vapor deposition process.

68. The method according to claim 46 wherein the electrically conductive porous material is applied by a screen printing process.

69. The method according to claim 46 wherein the electrically conductive porous material is applied by a spraying process.

70. The method according to claim 46 wherein the electrically conductive porous material is applied by a sputtering process.

71. The method according to claim 46 wherein the electrically conductive porous material is applied by a dispensing process.

72. The method according to claim 46 wherein the electrically conductive porous material is applied by a dipping process.

73. The method according to claim 46 wherein the electrically conductive porous material is applied by a spinning process.

74. The method according to claim 46 wherein the electrically conductive porous material is applied as a conductive ink.

75. The method according to claim 46 wherein the electrically conductive porous material is applied by a patterning process.

76. The method according to claim 46 wherein the electrically conductive porous material is applied by a shadow masking process.